# Use of the dCache Resilient Pool in Grid Jobs

Shreyas Bhat & Ken Herner

DUNE Core Computing Meeting

6 May 2019

# dCache Storage Areas

| | Quota/Space | Retention Policy | Retention Lifetime on Disk | Use case | Tape backed? | Path |
|---|---|---|---|---|---|---|
| Persistent | None/~100 TB/expt | Expt-managed | Until manual deletion | Immutable files w/ long lifetime | N | /pnfs/<expt>/persistent |
| Scratch | None | LRU | Varies (~30 d) | Immutable files w/ short lifetime | N | /pnfs/<expt>/scratch |
| Tape-backed | None/(O(4 PB)) | LRU (evicted from disk) | ~30 d | Long-term archive | Y | /pnfs/<expt>/<path> |
| Resilient | None | None/jobsub managed | ~30 d | Tarballs w/ custom code for grid jobs | N | /pnfs/<expt>/resilient |

Adapted from https://cdcvs.fnal.gov/redmine/projects/fife/wiki/Understanding_storage_volumes

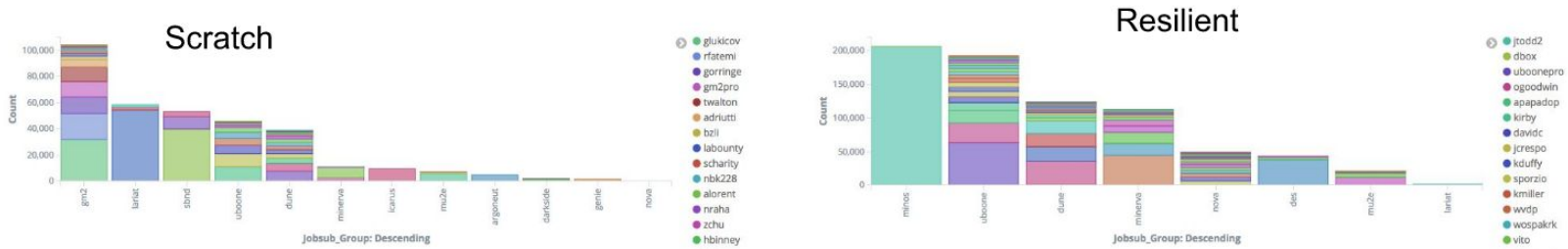
# Before Resilient

- User tarballs with custom code uploaded to scratch dCache
- Access these tarballs from hundreds, sometimes thousands of jobs
- Slowed down access for everyone
- Actual example:  5 GB tarball (compressed) uploaded to scratch dCache, accessed by over 1000 jobs

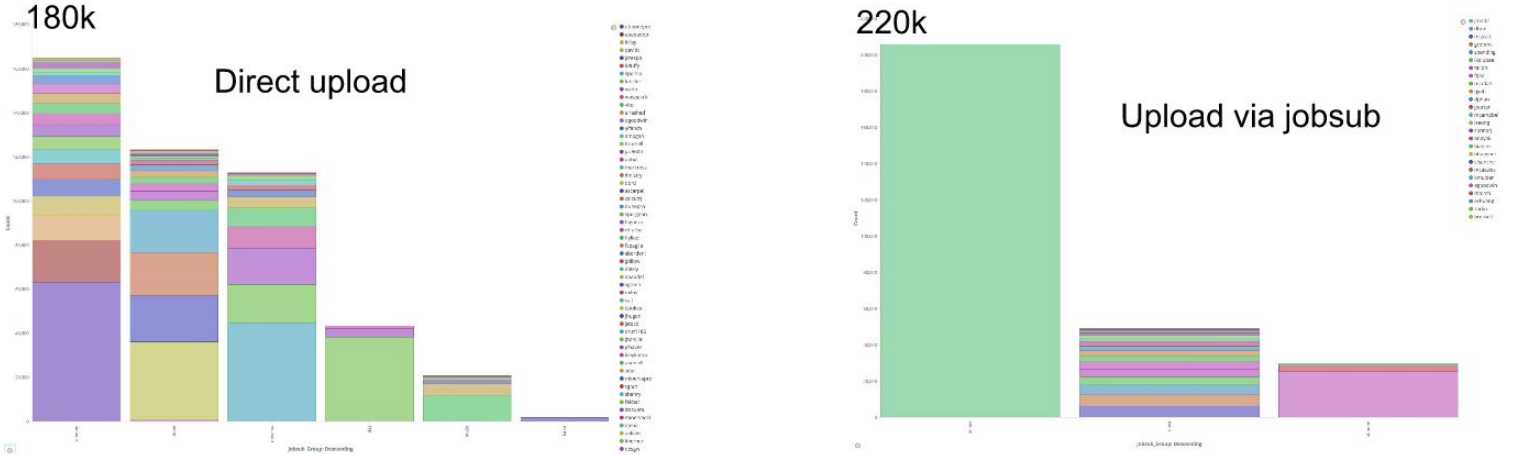
# Resilient dCache Pool

- Solution:  Come up with new dCache pool that shares hardware with scratch dCache
- Replicate every file in new pool by some to-be-determined factor (20x)
- Since most FIFE users interact with the grid through jobsub_client, create a feature that uploads files and tarballs directly to resilient dCache, and handle cleanup
- Note that for standard experiment-wide code, CVMFS is still the way to go!

# Current Status




Number of tar files (code) pulled from dCache during last 7 days by experiment (scratch vs resilient)




Number of tar files (code) pulled from dCache during last 7 days by experiment (direct upload vs jobsub upload)

T. Levshina, FIFE Meeting 4 Apr 2019

# Cleanup?

Table 1

| Experiment | # of Tar Files | Size(GB) | # Old Files | Size of Old Files(GB) |
|---|---|---|---|---|
| mu2e | 496 | 344 | 347 | 263 |
| uboone | 5638 | 260 | 2377 | 137 |
| dune | 2395 | 95 | 1091 | 25 |
| nova | 57 | 12 | 57 | 12 |

Tar files in resilient areas by experiment (old == didn't access during last 3 months)

Factor of 20!

T. Levshina, FIFE Meeting 4 Apr 2019

# Using Resilient dCache with Jobsub

- This is why we recommend people use jobsub_client feature to upload files and tarred directories to resilient dCache: *we handle the cleanup!*

Specifics: When given flag to upload a file to the jobsub-configured dropbox (within resilient dCache):

- jobsub_client calculates the hash of the file
- Creates a directory in /pnfs/dune/resilient/jobsub_stage/<hash>
- Uploads file to that directory
- Copies that file to job and in some cases, untars it in the initial working directory
- All file transfer done using IFDHC

Due to hashing mechanism, we won't re-upload the same tarball each time jobsub_submit is run.

Cleanup policy: 30 days old AND not being used by any job in queue

# Jobsub file options at submit time

Options:

- -f (NO CLEANUP - not preferred for resilient dCache use)
- -f dropbox:// (Upload files to resilient)
- -f tardir:// (Upload directories to resilient as tarballs)
- --tar_file_name dropbox:// (Upload tarball to resilient, have it unpacked in job)
- --tar_file_name tardir:// (Upload directory to resilient as tarball, have it unpacked in job)

Notes:

- For most cases, use the *--tar_file_name* options for tarballs
- For any of the dropbox:// options, exclude unneeded files (.root, .svn, .git files)
- tardir:// automatically includes a default tar exclusion file that excludes .tar, .git, .jpg, etc. files
    - Make your own: https://cdcvs.fnal.gov/redmine/projects/jobsub/wiki/Jobsub_submit#tarball-exclusion-file-syntax

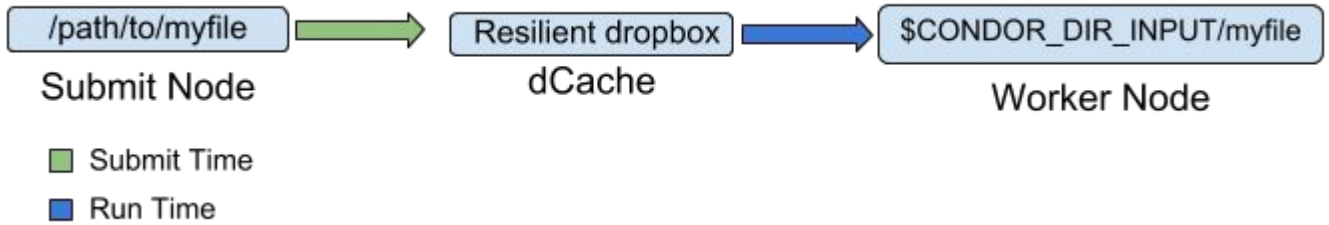
# jobsub_submit -f /path/to/myfile

- *Not recommended for use with resilient dCache paths*
- /path/to/myfile must be grid-accessible
- jobsub wrapper will transfer the file from /path/to/myfile to $CONDOR_DIR_INPUT in the job
- No cleanup!  Don’t put /path/to/myfile in resilient space and use this.
- Example:

jobsub_submit -G dune -f /path/to/myfile <other args> file://path/to/my/executable <executable_args>

# jobsub_submit -f dropbox:///path/to/myfile

- *Best for multiple file uploads to resilient space*
- /path/to/myfile must be accessible *locally* (on the submit node)
- Jobsub will clean this up

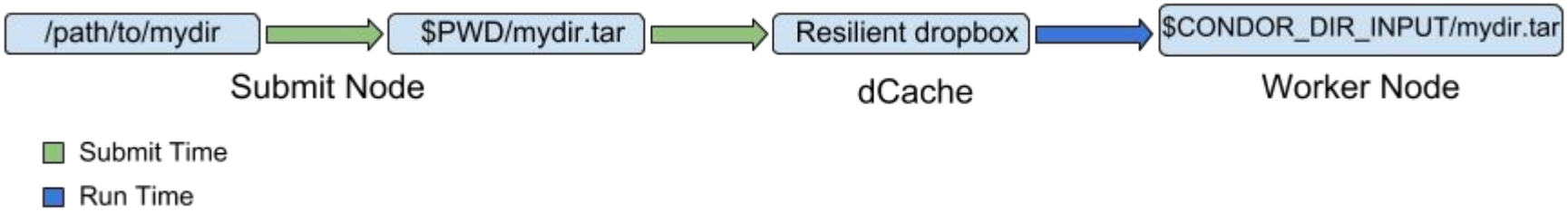



Example:

jobsub_submit -G dune -f dropbox:///path/to/myfile -f dropbox:///path/to/anotherfile <other args> file://path/to/my/executable <executable_args>

# jobsub_submit -f tardir:///path/to/mydir

- /path/to/mydir must be accessible *locally* (on the submit node)
- Jobsub will clean this up

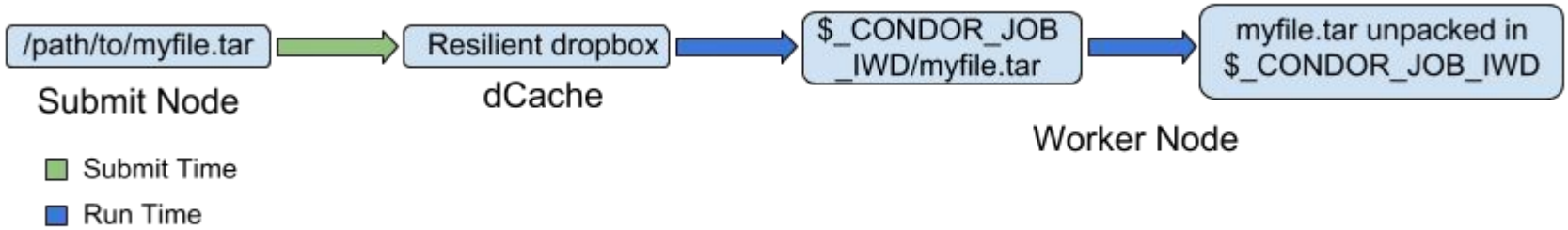



Example:

jobsub_submit -G dune -f tardir:///path/to/mydir <other args> file://path/to/my/executable <executable_args>

# jobsub_submit --tar_file_name dropbox:///path/to/myfile.tar

- *Best for single-tarball upload*
- /path/to/myfile.tar must be accessible *locally* (on the submit node)
- Note:  $_CONDOR_JOB_IWD is just the directory your job will always start in
- Jobsub will clean up

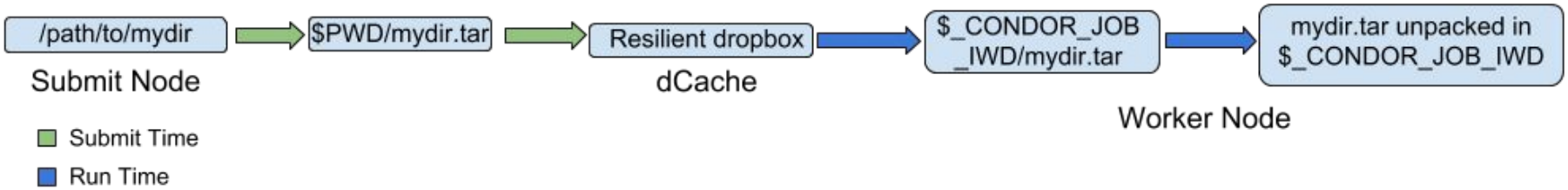



Example:

jobsub_submit -G dune --tar_file_name dropbox:///path/to/myfile.tar <other args> file://path/to/my/executable <executable_args>

# jobsub_submit --tar_file_name tardir:///path/to/mydir

- *Best for uploading a single directory*
- /path/to/mydir must be accessible *locally* (on the submit node)
- Jobsub will clean this up




Example:

jobsub_submit -G dune --tar_file_name tardir:///path/to/mydir <other args>
file://path/to/my/executable <executable_args>

# Challenges with jobsub and resilient space

- If jobsub_client is tarring up a big directory and uploading it, jobsub_submit takes more time
- Filling up /tmp space
  - This can be worked around by exporting $TMPDIR somewhere else that has more space

# Future:  jobsub and resilient space

- Filling up /tmp space while creating tarball:  proposed --tar_out_dir flag (Redmine 22347) - no need for $TMPDIR workaround
- Sample submit command might look like

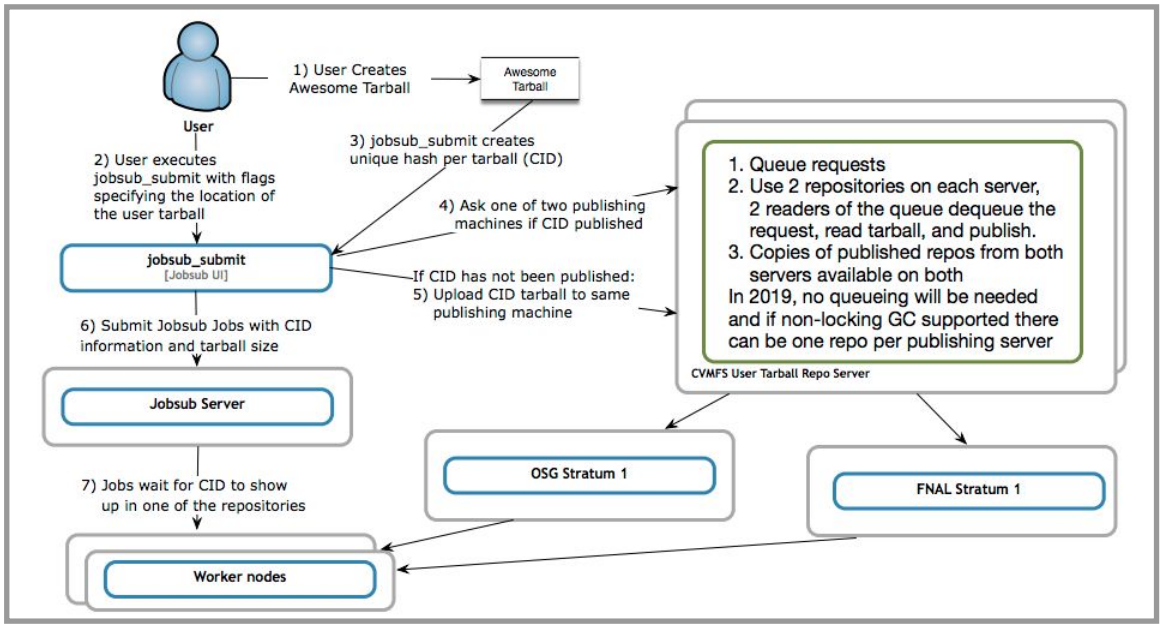
  jobsub_submit -G dune --tar_file_name tardir:///path/to/tarball --tar_out_dir /path/to/all/of/my/job/tarballs_directory

- Jobsub_client would create the tarball and compress it in --tar_out_dir value

# Challenges with dCache resilient space

- Using huge amounts of dCache read/write pools (scratch and resilient share this)
- LRU policy for scratch space is invoked a lot more than before (average lifetime decreases)

# Future: Rapid Code Distribution on CVMFS (D. Dykstra)




- jobsub_client commands would look exactly the same
- In development phase (diagram above may change)

Thank you!